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Plasma Deflection Test Setup for E-Sail Propulsion Concept

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Abstract

The Electronic Sail or E-Sail is a novel propulsion concept based on momentum exchange between fast solar wind protons and the plasma sheath of long positively charged conductors comprising the E-Sail. The effective sail area increases with decreasing plasma density allowing an E-Sail craft to continue to accelerate at predicted ranges well beyond the capabilities of existing electronic or chemical propulsion spacecraft. While negatively charged conductors in plasmas have been extensively studied and flown, the interaction between plasma and a positively charged conductor is not well studied. We present a plasma deflection test method using a differential ion flux probe (DIFP). The DIFP measures the angle and energy of incident ions. The plasma sheath around a charged body can be measured by comparing the angular

distribution of ions with and without a positively charged test body. These test results will be used to evaluate numerical calculations of expected thrust per unit length of conductor in the solar wind plasma. This work was supported by a NASA Space Technology Research Fellowship.